FPL.

October 30, 2013
L-2013-287

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Re: Turkey Point Nuclear Generating Station
Docket Nos. 50-250 and 50-251
License Renewal (LR) Reactor Vessel Internals (RVI) Inspection Program
Response to Request for Additional Information (RAI)

References:

1. Florida Power & Light Company (FPL) letter L-2012-438 to the USNRC, dated December 14, 2012, License Renewal (LR) Reactor Vessel Internals (RVI) Commitment Implementation Report and Inspection Plan, Agencywide Documents and Access Management System (ADAMS) Accession No. ML12363A103.

2. Electric Power Research Institute (EPRI) Materials Reliability Program Report 1022863 (MRP-227-A), "Pressurized Water Reactor Internals Inspection and Evaluation Guidelines," ADAMS Accession Nos. ML12017A194, ML12017A196, ML12017A197, ML12017A191, ML12017A192, ML12017A195, and ML12017A199

3. Revision 1 to the Final Safety Evaluation of EPRI Materials Reliability Program Report 1016596 (MRP-227), Revision 0, "Pressurized Water Reactor Internals Inspection and Evaluation Guidelines," dated December 16, 2011, ADAMS Accession No. ML11308A770

4. EPRI Report 1013234, "Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191)," ADAMS Accession No. ML091910130.

5. NRC Email from Farideh Saba to Bob Tomonto, Olga Hanek, Stavroula Mihalakea, "RAIs for Turkey Point-MF1485/86," dated September 27, 2013, ADAMS Accession No. ML13274A144.

6. NRC email from Audrey Klett to Stavroula Mihalakea, "Turkey Point RAI Due Date for MF 1485/86," dated October 30, 2013.

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated December 14, 2012 (Reference 1), Florida Power & Light Company (FPL) submitted its License Renewal Reactor Vessel Internals (RVIs) Commitment Implementation Report and Inspection Plan that credits the implementation of Materials Reliability Program (MRP)-227-A (Reference 2) at Turkey Point Units 3 and 4 for NRC staff review. The NRC staff reviewed Revision 0 of MRP-227 and issued a final safety evaluation on December 16, 2011 (Reference 3).

The NRC staff reviewed the information provided by FPL in its submittal and requested additional information to complete their review (Reference 5). The NRC staff's request for additional information (RAI) and FPL's responses are found in Attachment 1.

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FPL is participating in a joint industry program through the Pressurized Water Reactor Owners Group (PWROG) to develop responses to RAI-5. Per Reference 6, the NRC acknowledged that that the response for RAI-5 will be provided at a later date.

The information provided herein does not change the conclusions stated in Reference 1.

Should there be any questions, please contact Mr. Robert J. Tomonto, Licensing Manager at 305 246-7327.

Very truly yours,

Michael Kiley
Vice President
Turkey Point Nuclear Plant

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Attachment

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, NRR
USNRC Senior Resident Inspector, Turkey Point Nuclear Plant

NRC REQUEST FOR ADDITIONAL INFORMATION AND FPL RESPONSES

RAI-1

Appendix A of the MRP-227-A report provides a list of RVI operating experience events that have occurred in Westinghouse, Combustion Engineering, and Babcock and Wilcox pressurized water reactor designs to date. Describe aging degradation (if any) that occurred thus far in the RVI components of Turkey Point 3 and 4.

FPL Response to RAI-1

The Turkey Point Units 3 and 4 RVI components have not suffered any aging degradation thus far.

RAI-2

Appendix A to MRP-227-A indicates that failures of Alloy X-750 clevis insert bolts were reported by one Westinghouse-designed plant in 2010. Appendix A to MRP-227-A also stated that the most likely cause for failure was bolts cracked due to primary water stress corrosion cracking (PWSCC). Appendix A to MRP-227-A indicates that most of the failures of Alloy X-750 material have occurred in material with heat treatment condition AH (hot rolled "equalized" at 1625 °F followed by 20 hours at 1300 °F). Alloy X-750 given the high temperature heat treatment (HTH) has proven more resistant to PWSCC.

The only aging mechanism requiring management by MRP-227-A for clevis insert bolts is wear. The clevis insert bolts are categorized as an "Existing Programs" component under MRP-227-A, with the American Society of Mechanical Engineers (ASME) Code, Section XI, Inservice Inspection Program credited for managing aging due to wear only. The ASME Code, Section XI specifies a VT-3 visual inspection for the clevis insert bolts, which may not be adequate to detect cracking before it results in bolt failure.

Therefore, discuss if FPL will modify the MRP-227-A inspection requirement for clevis insert bolts to require an inspection that will detect cracking. If the inspection requirement is not modified, provide a technical justification for the adequacy of the existing VT-3 visual inspection requirement to detect cracking before it results in bolt failure.

FPL Response to RAI-2

The Turkey Point Units 3 and 4 RVI incorporate X-750 clevis insert bolts which are classified as B-N-3 components in the plants' Section XI Programs. The clevis insert bolts are also categorized as Existing Program components in the Turkey Point Units 3 and 4 RVI Aging Management Program (AMP).

The VT-3 inspection requirement of ASME Section XI will not be modified or augmented in the Turkey Point Units 3 and 4 RVI AMP based on the guidance provided by Westinghouse in InfoGram IG-10-1, dated March 31, 2010. This Westinghouse communication described the failure of X-750 clevis insert bolts, discovered by another utility while conducting visual examinations during its 10 year ISI vessel inspection. The InfoGram stated that the incident presented no safety or operability concerns for the rest of the industry based on engineering evaluations performed by Westinghouse for the affected utility. No further actions regarding X-750 clevis insert bolts were recommended to the industry in the InfoGram, or in any other Westinghouse communications on this subject issued to date.

RAI-3

Applicant/Licensee Action Item (A/LAI) 3 of Reference 3 states that the existing aging management program (AMP) for the control rod guide tube (CRGT) split pins shall identify any changes to the program that should be implemented for the period of extended operation. In Reference 1, FPL stated that CRGT split pins were replaced by cold worked type 316 stainless steel material. This replacement would potentially resist stress corrosion cracking (SCC) because the replaced 316 material is more resistant to SCC than the Alloy X-750. However, Table 3-3 of the MRP-227-A report indicates that these split pins are susceptible to wear and fatigue. Since the replaced material – type 316 stainless steel – has lower tensile and yield strengths than

Alloy X-750 material, it is likely that lower strength type 316 stainless steel material would potentially be susceptible to aging degradation mechanisms due to wear and fatigue.

Describe how FPL will manage the aging degradation due to wear and fatigue of the split pins. Confirm if split pin inspection will be performed under ASME Code, Section XI, Examination Category B-N-3.

FPL Response to RAI-3

Turkey Point Units 3 and 4 proactively replaced the X-750 split pins with cold worked 316 SS in 2007 and 2008, respectively. The design criteria for the replacement cold worked 316 SS split pins included a service life of 40 years at 100% capacity factor. A number of aging degradation mechanisms were evaluated, including wear and fatigue (low and high cycle). A design criteria evaluation performed by Westinghouse in 2007 demonstrated that the replacement split pins provided adequate resistance to wear and fatigue over a 40 year design life.

A subsequent structural and fatigue evaluation of the impact of a 15% Extended Power Uprate on the Turkey Point Units 3 and 4 reactor vessel internals (RVI) was performed in 2009. That evaluation determined that the structural integrity and fatigue usage factors remained acceptable for the split pins during the period of extended operation.

The Turkey Point Units 3 and 4 RVI AMP defines the intended function of the split pins and associated guide tube assemblies as "Guide and Support RCCA's", consistent with the definition in the previously approved Westinghouse topical report (WCAP-14577 Rev. 1-A), published in 2001. Since the split pins and guide tube assemblies do not provide core support, they are not categorized as B-N-3 components in the Turkey Point Units 3 and 4 Section XI Programs.

Turkey Point Units 3 and 4 perform VT-3 inspections of the accessible portions of the upper core plates, defined as B-N-3 components, during 10 year ISI RVI inspections. These inspections provide a partial view of the split pin heads associated with the peripheral guide tube assemblies from the top of the upper core plate, and the split pin leaves associated with all guide tube assemblies from the bottom of the upper core plate.

A foreign object search and retrieval (FOSAR) inspection of the reactor vessel is also performed every refueling outage prior to full core reload. Visual inspection of the steam generators' primary channel heads are also conducted during outages when eddy current testing is performed. These inspections should detect the presence of split pin fragments in the unlikely event that failure does occur.

In summary, the previous evaluations conducted to support installation of the cold worked 316 SS split pins and subsequent implementation of a 15% Extended Power Uprate adequately address aging degradation of the split pins due to wear and fatigue. The split pins are not considered B-N-3 components under the ASME Section XI Program. Previously existing inspections of the upper core plate, reactor vessel and steam generators' primary channel heads are considered adequate to monitor the integrity of the split pins.

RAI-4

a. Identify all RVI components in the Turkey Point 3 and 4 plant design that are defined in the current licensing basis (CLB) as ASME Code, Section XI, Examination Category B-N-3 core support structure components. For these components, identify which of the four inspection categories in MRP-227-A is applicable to the component.

b. If a component identified in the reply to Part (a) is defined as either a "Primary Category" or "Expansion Category" component, identify any differences between the inspections that would be performed on the components under MRP-227-A versus the Turkey Point 3 and 4 ASME Code, Section XI inservice inspection program.

c. For the components identified in Part (b), clarify how the differences in inspection bases for these components will be reconciled consistent with the CLB for the facility.

FPL Response to RAI-4

a. A listing of the ASME Section XI Inservice Inspection Program B-N-3 components in the Turkey Point Units 3 and 4 CLB is provided in the table below. This table also provides the corresponding component categorization under MRP-227-A and the Turkey Point RVI AMP.

RVI COMPONENT	ASME Section XI Category	MRP-227-A CATEGORY	ASME Section XI 10-year ISI Inspection Method	RVI AMP/ MRP-227-A Inspection Method
Lower Core Plate	B-N-3	Existing Program	VT-3	none
Fuel Alignment Pins	B-N-3	No Additional Measures	VT-3	none
Lower Support Forging	B-N-3	Expansion	VT-3	EVT-1
Lower Support Columns	B-N-3	Expansion	VT-3	EVT-1
Lower Support Column Bolting	B-N-3	Expansion	VT-3	UT
Radial Keys	B-N-3	No Additional Measures	VT-3	none
Secondary Core Support	B-N-3	No Additional Measures	VT-3	none
Clevis Insert	B-N-3	No Additional Measures	VT-3	none
Upper Core Plate Alignment Pins	B-N-3	Existing Program	VT-3	none
Internals Hold-Down Spring	B-N-3	Primary	VT-3	height measurement
Clevis Insert Bolting	B-N-3	Existing Program	VT-3	none
Core Barrel Flange	B-N-3	Existing Program	VT-3	none
		Primary (Upper Core Barrel Flange Weld)		EVT-1
Core Barrel Outlet Nozzles	B-N-3	Expansion (Core Barrel Outlet Nozzle Welds)	VT-3	EVT-1
Lower Core Barrel	B-N-3	Primary (Lower Core Barrel Girth Weld, Lower Core Barrel Flange Weld)	VT-3	EVT-1
		Expansion (Lower Core Barrel Cylinder Axial Welds)		EVT-1
Upper Core Barrel	B-N-3	Primary (Upper Core Barrel Girth Weld)	VT-3	EVT-1
		Expansion (Upper Core Barrel Cylinder Axial Welds)		EVT-1
Baffle and Former Assembly	B-N-3	Primary	VT-3	VT-3
Baffle-Former Bolts	B-N-3	Primary	VT-3	UT
Baffle Edge Bolts	B-N-3	Primary	VT-3	VT-3
Barrel-Former Bolts	B-N-3	Expansion	VT-3	UT
Upper Support Plate	B-N-3	No Additional Measures	VT-3	none
Upper Support Ring	B-N-3	Existing Program	VT-3	none
Upper Core Plate	B-N-3	Expansion	VT-3	EVT-1
Upper Support Column Bases	B-N-3	No Additional Measures	VT-3	none
Upper Support Columns	B-N-3	No Additional Measures	VT-3	none
Upper Support Column Bolting	B-N-3	No Additional Measures	VT-3	none

b. The inspection method for the ASME Section XI Inservice Inspection Program B-N-3 components is a VT-3. The inspection methods for the Primary and Expansion components are provided in the table. The RVI AMP inspections are considered augmented inspections under the ASME Section XI Inservice Inspection Program and do not replace the existing VT-3 inspection requirements for the B-N-3 components.

c. There is no need for reconciliation since the RVI AMP inspections do not replace the Existing ASME Section XI Inservice Inspection Program inspection requirements.

RAI-5

As discussed in Section 3.2.5 of Reference 3, A/LAI 1 requires licensee verification that the detailed component state at the end of the period of extended operation is bounded by the detailed assumptions of the MRP. Please provide the following information related to verification of the applicability of MRP-227-A to Turkey Point 3 and 4:

a. Identify whether the Turkey Point 3 and 4 RVIs include nonweld or bolting austenitic stainless steel components with 20 percent or greater cold work from fabrication and operating surface tensile stresses greater than 30 kilopound force per square inch. Provide a plant-specific evaluation to determine the aging management requirements for the identified components.

b. Identify whether Turkey Point 3 and 4 used an atypical fuel design or fuel management that could make the assumptions of MRP-227-A regarding core loading/core design nonrepresentative for that unit, including those during power changes and uprates. If so, describe how the differences were reconciled with the assumptions of MRP-227-A, or provide a plant-specific AMP for affected components as appropriate.

FPL Response to RAI-5

FPL is participating in a joint industry program through the Pressurized Water Reactor Owners Group (PWROG) to develop responses to RAI-5. Per Reference 6, the NRC acknowledged that that the response for RAI-5 will be provided at a later date.

RAI-6

The staff requests the following clarifications.

a. In response to A/LAI 2 in Reference 1, FPL stated that the flux thimble tube plug was 308SS rather than the 304SS described in MRP-191 (Reference 4). FPL also stated that both alloys are wrought austenitic stainless steel alloys with the same screening criteria for all degradation mechanisms. However, since "308" typically refers to a weld alloy rather than a wrought alloy, clarify whether flux thimble tube plugs are wrought Alloy 308, weld Alloy 308, or another alloy type. If weld alloy is used for the flux thimble tube plugs, describe whether a change to aging management strategy is required.

b. In Attachment 1, Table 1 of Reference 1, FPL stated that the upper instrumentation column for Unit 4 was 316SS. However, in response to A/LAI 7 in Reference 1, FPL stated that the upper instrumentation columns and supports for Turkey Point Unit 4 are constructed of cast austenitic stainless steel (CASS). Clarify whether the upper instrumentation columns are constructed of wrought 316SS or CASS.

FPL Response to RAI-6

a. A review of the Westinghouse manufacturing records revealed that the Turkey Point flux thimble tube plugs are constructed of 'stainless steel (AISI 308 Modified) wire' with a chemistry conforming to alloy SFA 5.9, Class ER308, ASME Specification for Bare Welding Rods and Electrodes. The chemical compositions of ER308 and 304 SS are shown below:

	C	Cr	Ni	Mn	Si	P	S
ER308 (UNS S30880)	0.08 max	19.5-22.0	9.0-11.0	1.0-2.5	0.3-0.65	0.03 max	0.03 max
304 (UNS S30400)	0.08 max	18.0-20.0	8.0-10.5	2.0 max	1.0 max	0.045 max	0.03 max

Per Westinghouse specifications, the ER308 alloy includes elemental modifications that provide for the retention of at least 5% by volume of Ferrite in the product form. While the ER308 chemistry is slightly more alloyed compared to 304SS, which itself may contain up to 3% retained ferrite, the required mechanical properties are similar to those of lightly strain hardened 304 SS. Specifically, the applicable Westinghouse specification requires at least 35% Elongation and 45% Reduction in Area in the mechanical property requirements. These requirements in turn imply that the ferrite content should not be significantly greater than the 5% minimum. Thus the properties and aging performance of the ER308SS are expected to be quite similar to those of 304SS.

EPRI MRP-191 considered aging degradation of flux thimble tube plugs manufactured from 304SS and screened them in for damage from irradiation assisted stress corrosion cracking (IASCC), wear, irradiation embrittlement, and void swelling of the plug and, SCC of the weld joining the plug to the flux thimble tube. The irradiation embrittlement and void swelling mechanisms screen in, because of the very high irradiation fluences that the plugs would be subject to in service. The only possible potential additional aging degradation mechanism that could be activated if the flux thimble tubes were manufactured from ER308 alloy would be thermal embrittlement. However, due to the very high fluence experienced by the flux thimble plugs, they already screened in for the irradiation form of embrittlement. Moreover, at the expected fluence levels, the potential loss of toughness due to irradiation embrittlement in type 304SS is already very severe and any additional loss of toughness due to thermal embrittlement would be inconsequential. Since embrittlement aging has already been fully considered, there is no impact of the use of ER308 on the aging management strategy for the flux thimble tubes in the Turkey Point RVI AMP.

b. The previous statement concerning the upper instrumentation columns materials of construction was incorrect. The upper instrumentation columns are constructed of 304 SS for Turkey Point Units 3 and 4. The associated brackets, clamps, terminal blocks and conduit straps are constructed of 304 SS for Unit 3; however, for Unit 4, the brackets, clamps, terminal blocks and conduit straps are constructed of both CF8 and 304 SS.